REMARKS

Applicants appreciate the thorough examination of the application as evidenced by the Action mailed August 29, 2001. Claims 23-44 are currently pending. Applicants have added new Claims 45-66.

Claims 23-26, 30, 36, 37, 39, and 40 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,029,602 to Bhatnagar (Bhatnagar). Claims 28, 29, 31-35, 38, and 41-44 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bhatnagar in view of U.S. Patent No. 6,207,005 to Henley et al. (Henley). Claim 30 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,055,927 to Shang et al. (Shang). Claims 27-29 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Shang in view of U.S. Patent No. 5,534,069 to Kuwabara et al. (Kuwabara). Applicants traverse these rejections for at least the following reasons.

I. Claims 23, 36 and 39 Are Patentable Over Bhatnagar

Claims 23-26, 30, 36, 37, 39, and 40 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Bhatnagar. The Action states at page 2 that:

> Bhatnagar discloses a remote-plasma processing apparatus that has a plasma generator (500) connected to a processing chamber (510). Bhatnagar's apparatus also has a wafer support in the processing chamber and quart [sic] lamps for heating the wafer. Structurally, the claimed apparatus is the same as that of Bhatnagar. The claimed oxygen radical or plasma annealing unit and oxygen radical or plasma annealing chamber read on the plasma generator and processing chamber of Bhatnagar's apparatus, respectively.

(Citations omitted). Applicants respectfully traverse this rejection.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. The identical invention must be shown in as complete detail as is contained in the . . . claim." M.P.E.P. § 2131 (citations omitted). Applicants have amended Claim 23 to more particularly recite an oxygen radical or plasma annealing unit comprising a gas source selected from the group consisting of O_2, NH_3, Ar, N_2, and N_2O.

Bhatnagar neither discloses nor suggests an oxygen radical or plasma annealing unit comprising a gas source selected from the group consisting of O_2, NH_3, Ar, N_2, and N_2O as

recited in Claim 23. In contrast, Bhatnagar proposes a CVD apparatus attached to a remote microwave plasma source module. At Column 8, lines 32 to 33, Bhatnagar states that "[h]alogenated gases or vapors, such as CF_4, ClF_3, F_2, and NF_3 may be used as a process gas." Bhatnagar neither discloses nor suggests the use of a gas source selected from the group consisting of O_2, NH_3, Ar, N_2, and N_2O as recited in Claim 23. Nor would it be obvious to provide the oxygen radical or plasma annealing unit comprising a gas source selected from the group consisting of O_2, NH_3, Ar, N_2, and N_2O as recited in Claim 23 in view of the teachings of Bhatnagar. Bhatnagar is directed to a CVD apparatus. Bhatnagar does not describe or suggest an oxygen radical or plasma annealing apparatus as recited in Claim 23. For at least the foregoing reasons, Applicants respectfully submit that Claim 23 is patentable over Bhatnagar and request that this rejection be withdrawn.

Turning now to Claim 36, Applicants submit that Bhatnagar neither discloses nor suggests an apparatus for forming a thin film on a substrate comprising "a crystallization annealing chamber for processing a substrate" as recited in Claim 36. Bhatnagar states at column 3, lines 40 to 45 that:

> A microwave plasma generating system may be incorporated with a CVD system to provide a plasma that is used to efficiently clean a processing chamber of the CVD system, for example. Plasma from the microwave plasma-generating system may also be used for etching, layer deposition, or other processes.

Applicants submit that Bhatnagar does not disclose an apparatus for forming a thin film comprising a crystallization annealing chamber for processing a substrate as recited in Claim 36. Furthermore, Applicants submit that the generic statement that plasma may be used "for other processes" does not suggest providing an apparatus comprising a crystallization annealing chamber for processing a substrate as recited in Claim 36. For at least the foregoing reasons, Applicants respectfully submit that Claim 36 is patentable over Bhatnagar and request that this rejection be withdrawn.

Regarding Claim 39, Applicants submit that Bhatnagar neither discloses nor suggests an apparatus for forming a thin film on a substrate comprising an oxygen radical or plasma annealing chamber configured to post-treat a dielectric layer and/or an upper electrode as recited in Claim 39. As noted above, Bhatnagar proposes CVD, etching and layer deposition chambers. Applicants respectfully submit that Bhatnagar does not disclose an apparatus for

forming a thin film on a substrate comprising an oxygen radical or plasma annealing chamber configured to post treat a dielectric layer and/or an upper electrode as recited in Claim 39. Furthermore, Applicants submit that the generic statement that plasma may be used "for other processes" does not suggest providing an apparatus comprising an oxygen radical or plasma annealing chamber configured to post treat a dielectric layer and/or an upper electrode as recited in Claim 39. For at least the foregoing reasons, Applicants respectfully submit that Claim 39 is patentable over Bhatnagar and request that this rejection be withdrawn.

II. The Dependent Claims Are Separately Patentable Over the Cited References

While the dependent claims 24, 25, 27-35, 37, 38, and 40-44 are patentable over the cited references by virtue of their dependence from patentable independent claims 23, 36, and 39, Applicants respectfully submit that many dependent claims are separately patentable over the cited references.

For example, Claim 28 recites an apparatus of Claim 27, wherein the source supplier comprises a liquid mass flow controller configured to control a flow of organic source liquid, an evaporator in fluid communication with the flow controller and configured to evaporate the source liquid, and a transfer gas source in fluid communication with the evaporator and configured to transfer an organic source from the evaporator to the source dispersion device. Applicants respectfully submit that the cited references neither disclose nor suggest the recitations of Claim 28. The Action cites column 7 in Kuwabara and states, "Kuwabara teaches that it is conventional for a CVD apparatus to have a gas source supplier that includes a flow meter (or liquid mass flow controller) (114), a bubbling container (or evaporator) (911) and a carrier gas source (or transfer gas source) (115)."

Applicants respectfully submit that, contrary to the assertions of the Action, the passage cited from Kuwabara does not describe a CVD gas source supplier. Instead, the cited passage describes an apparatus for inactivating an exhaust gas from a CVD apparatus, which exhaust gas collects in a rotary pump. In describing the embodiment of Figure 3, Kuwabara states at column 7, lines 19-36:

> "[T]he rotary pump **121** was used as an exhaust device for a CVD apparatus for forming an aluminum film, which will be described later. . . . After an aluminum film was formed on the surface of a semiconductor surface in the

> film forming chamber by CVD, generated reaction product or unreacted exhaust gas is exhausted using the rotary pump **121**. At that time, ethanol was accommodated in the bubbling container **111** as the inactivating substance **116**, and nitrogen gas was introduced from the carrier gas introducing port **115** via the flow meter as the carrier gas. Next, a mixture of gas of vapor of ethanol obtained by bubbling and nitrogen was introduced into the rotary pump **121** by opening the ballast valve **125**.

Furthermore, the other portions of Kuwabara do not disclose or suggest the recitations of Claim 28. The embodiment of Kuwabara that may arguably be directed to supplying vapor to a CVD apparatus, the embodiment of Figure 4 described at column 8, line 19 through column 10, line 3, proposes a vaporizing device wherein hydrogen is bubbled through a liquid dimethyl aluminum hydride material to form a vapor of liquid dimethyl aluminum hydride and hydrogen. This device does not include, for example, a liquid flow mass controller or an evaporator as recited in Claim 28. For at least the foregoing reasons, Claim 28 is separately patentable over the cited references.

Claim 29 recites an apparatus of Claim 28, wherein the source supplier comprises between 1 and 3 evaporators. The cited references neither disclose nor suggest a source supplier that comprises between 1 and 3 evaporators as recited in Claim 28. The first and second bubbling containers **1101** and **1201**, respectively, shown in Figure 4 of Kuwabara are not evaporators as recited in Claim 29 because, for example, the liquid material present in the outlet stream of the bubbling container is not present in the inlet stream to the bubbling container. For at least the foregoing reasons, Claim 29 is separately patentable over the cited references.

Claim 34 recites an apparatus of Claim 31, further comprising an oxygen radical or plasma annealing chamber configured to pre-treat a lower electrode and connected to the transfer chamber. The cited references neither disclose nor suggest an apparatus comprising an oxygen radical or plasma annealing chamber configured to pre-treat a lower electrode and connected to the transfer chamber. At most, Henley proposes a thermal annealing chamber **303** illustrated in Figure 3 and described at column 11, lines 9 through 18, not an oxygen radical or plasma annealing chamber as recited in Claim 34. For at least the foregoing reasons, Claim 34 is separately patentable over the cited references. For similar reasons, Claim 42 is also separately patentable over the cited references.

Claim 35 recites an apparatus of Claim 31, further comprising a cooling chamber connected to the transfer chamber, and a pre-heating chamber connected to the transfer chamber. The cited references neither disclose nor suggest an apparatus comprising a cooling chamber and a pre-heating chamber as recited in Claim 35. For at least the foregoing reasons, Claim 35 is patentable over the cited references. For similar reasons, Claim 44 is separately patentable over the cited references.

III. Conclusion

The concerns of the Examiner addressed in full, Applicants respectfully request withdrawal of all rejections and the issuance of a Notice of Allowance forthwith. The Examiner is encouraged to direct any questions regarding the foregoing amendments and/or remarks to the undersigned, who may be reached at (919) 854-1400.

Respectfully submitted,

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Washington, DC 20231, on November 21, 2001.

Monica L. Croom
Date of Signature: November 21, 2001

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Version with Markings to Show Changes Made

In the Claims:

Please amend Claim 23 as follows:

23. (Amended) An apparatus for forming a thin film on a substrate, the apparatus comprising:

a multi-functional chamber configured to deposit a dielectric layer on the substrate; and

an oxygen radical or plasma annealing unit connected to the multi-functional chamber and configured to provide oxygen radical or plasma gas to the multi-functional chamber to oxygen radical or plasma anneal one or more electrode and/or dielectric layers on the substrate in the multi-functional chamber, said oxygen radical or plasma annealing unit comprising a gas source selected from the group consisting of O_2, NH_3, Ar, N_2, and N_2O.

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